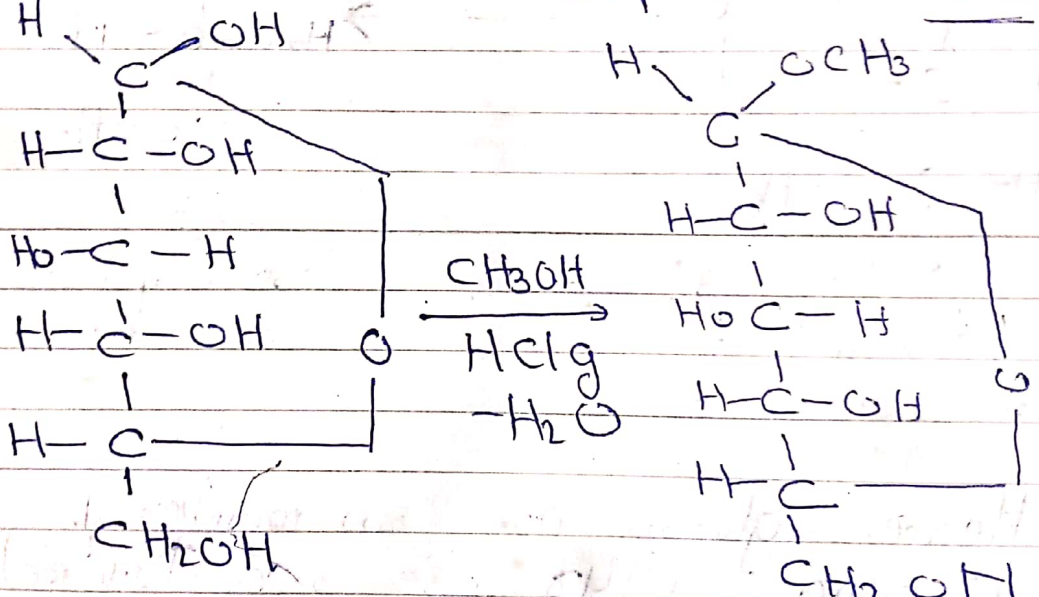
4th) Determination of the ring size—

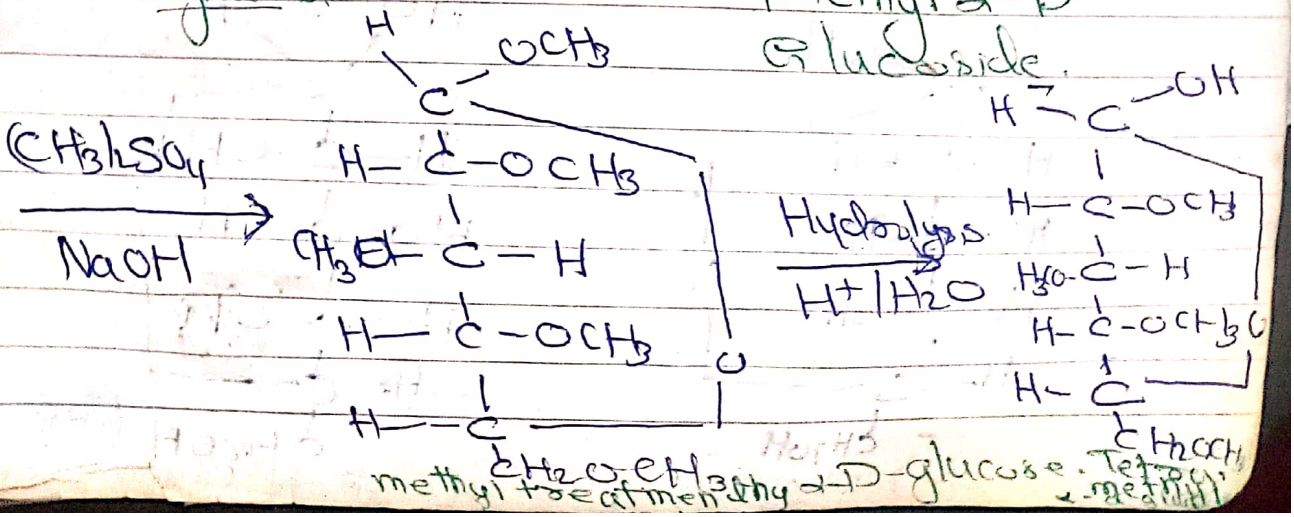
The hydroxyl groups at C-2, C-3, C-4, C-5, or C-6 could have been involved in the ring closure which makes possible the formation of three 3, 4, 5, 6 or 7 membered rings. 3 and 4 membered rings were discarded on the basis of stability. Seven membered ring is also discarded on the basis of high strain in the molecule. The five and six are the only possibility for ring size of glucose. The exact ring size in glucose is deduced on the basis of following steps:—

α-D-glucose is first treated with methyl alcohol in presence of HCl to give methyl α-D glucoside. The glucoside is then completely methylated by treatment with dimethyl sulphate in alkaline solution to

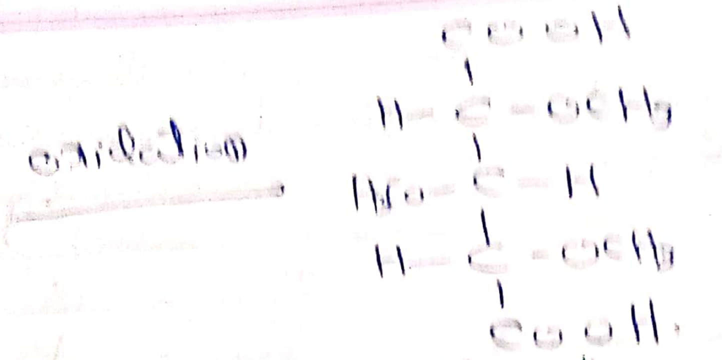
give methyl-tetra methyl α D-glucoside. The hydrolysis of this with dil HCl give tetramethyl α-D-Glucose which is then oxidised with concentrated nitric acid forming trimethoxy glutaric acid. The formation of this product clearly shows that α-D-Glucose has a six membered ring structure Had the α D-glucose possessed a five membered ring structure, dimethoxy succinic acid could have been obtained. These sequence of reactions can be depicted as —



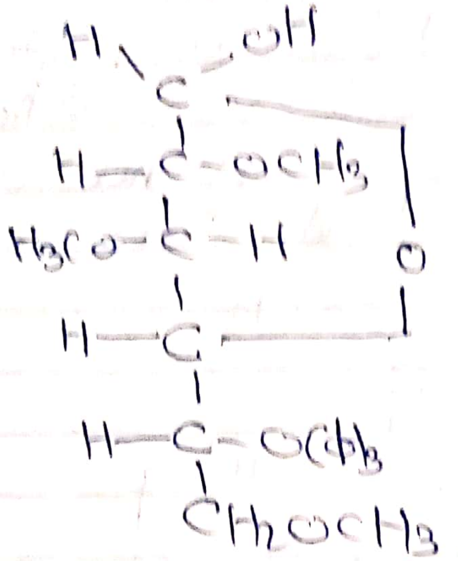
α Dglucose. Methyl α-D Glucoside.



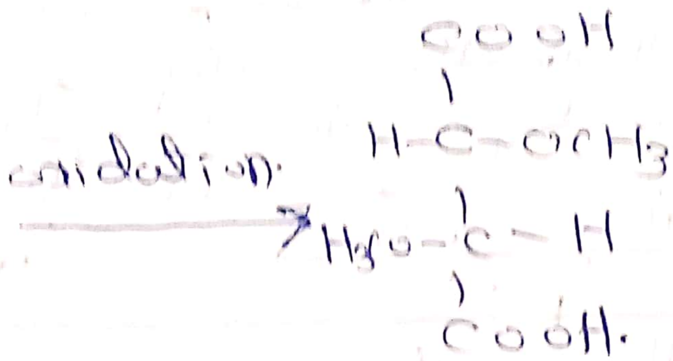
methyl treatment Tetra methyl α-D-glucose. Tetra methyl



Trimethoxy glutaric acid.

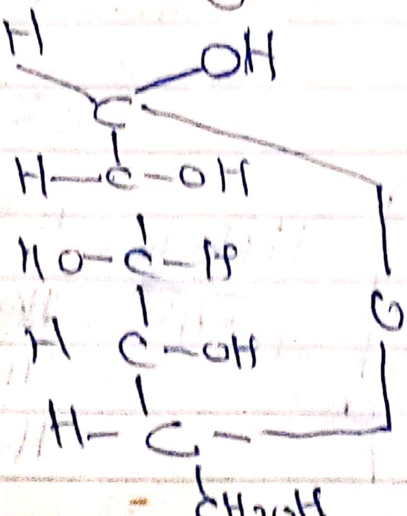


Tetramethyl α-D glucose

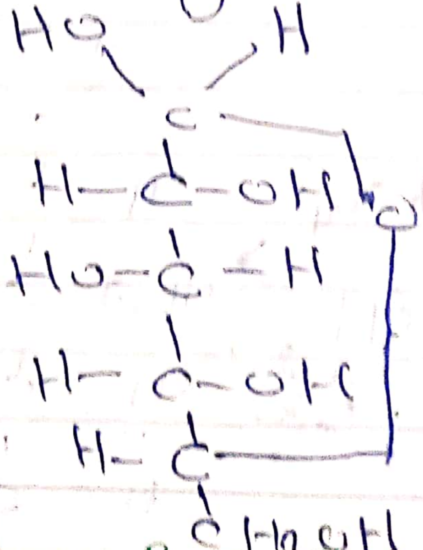


Dimethoxy succinic acid.

Hence glucose has six membered oxide ring (Pyranose ring structure).

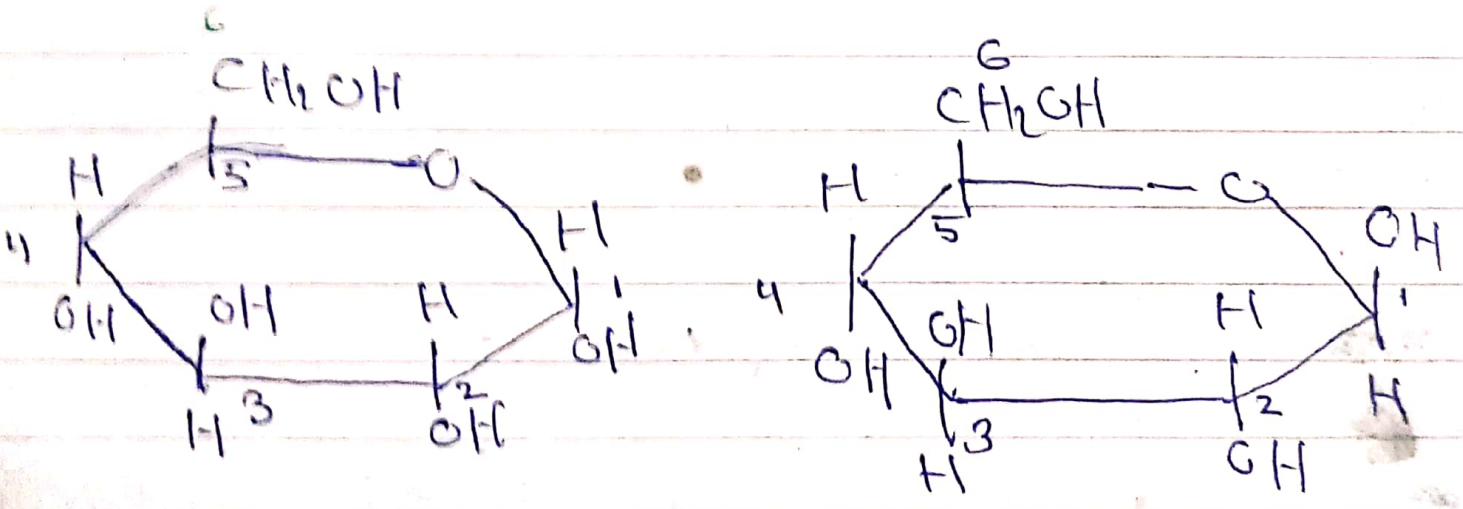


α D glucose.



β D glu...

The six membered ring is known as a pyran ring. So such type of ring is called hydroxy ring and two forms of glucose can be represented as :-

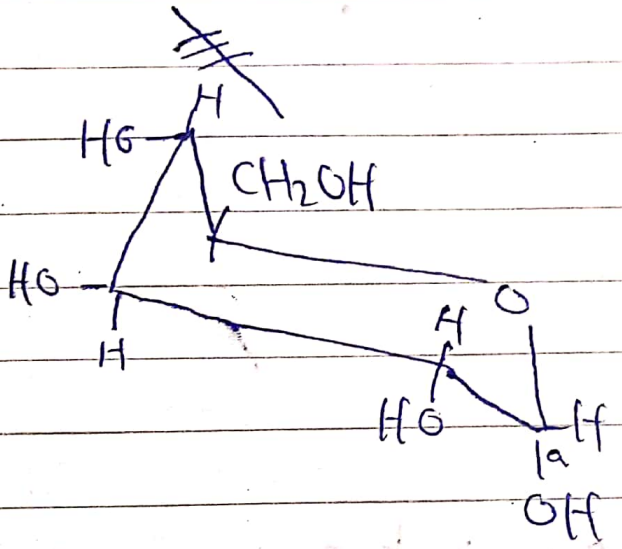


α - D - glucose

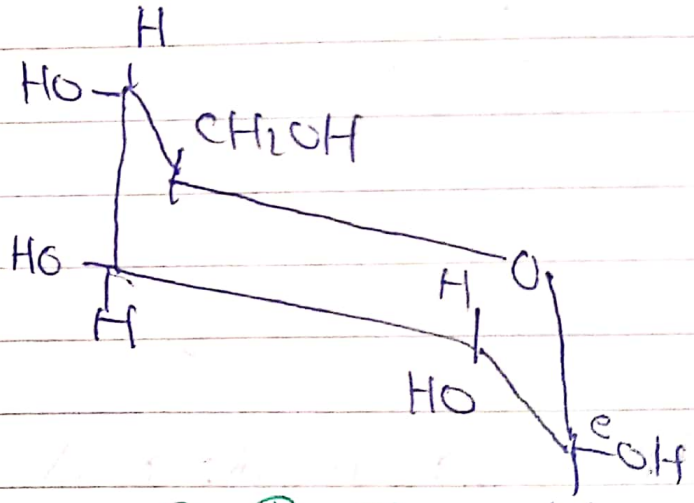
β - D - glucose.

Since glucose has a six membered ring, it bears close analogy with

C^4 cyclohexane and so should ideally be represented by conformation structure. X-ray analysis of crystalline α-D-glucose indicated the ~~existence of~~ exclusive existence of the chain form.



α D-Glucose



β-D-Glucose